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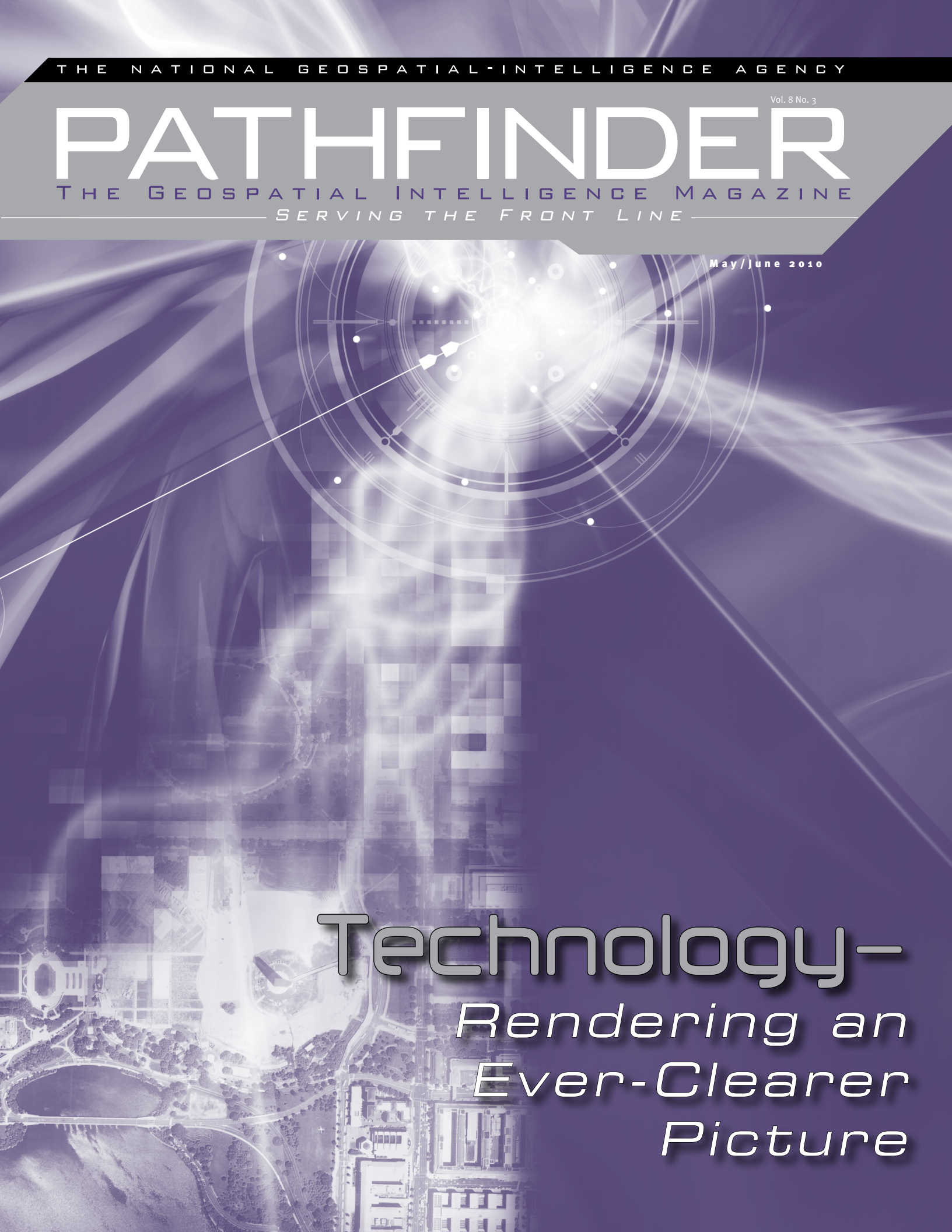
SERVING THE FRONT LINE

May/June 2010



Technology– Rendering an Ever-Clearer Picture

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On My Mind

NGA's Technology Advantage

We face adversaries who can be anywhere and everywhere, not bound by national borders or rules of war. They can bring destruction in a myriad of ways—from improvised explosive devices and suicide bombers to the sophisticated tools of cyber warfare. Our decision makers and warfighters need to know not only where our adversaries are and what they're doing, but also what they're planning to do and where those plans are being developed. NGA can help provide that information.

NGA and the geospatial intelligence community can meet national security challenges first by consistently improving our ability to collect the most reliable data. NGA is leading the strategic planning for an integrated collection capability comprising a robust collection architecture, which encompasses national technical means, commercial remote sensing, international options and integrated airborne data from across the Intelligence Community and Department of Defense.

Because of advances in technology, we are able to collect staggering amounts of data. One major challenge presented by this accelerating flow of information is how to turn raw data into useful intelligence in a timely way. Collaboration with industry, through focused investments in technology research and development, is one important factor in helping us meet this challenge.

We're working with our industry partners to refine existing technologies and create new ones to automate many of the time-consuming functions that pull our specialists away from exploitation and analysis tasks. Successes in automated tools include orthorectification, data correlation, change detection and feature extraction, with more advanced technologies for data storage and dissemination on the way.

Dissemination is yet another challenge. Our mission partners must have access to our resources. NGA is working with our national and allied partners in an ongoing drive to develop technology standards, architectures and procedures to ensure this access.

Partnership with industry is also critical in our efforts to customize existing commercial tools to better serve NGA, our domestic partners in the National System for Geospatial Intelligence (NSG) and our international partners in the Allied System for Geospatial Intelligence (ASG). These efforts help us bring the power of new technology to maritime data analysis, space-based algorithms, data fusion, knowledge management and other important efforts.

Collaboration is also key to getting the right intelligence tools into the hands of the people who need them. As the functional manager for GEOINT, NGA collaborates with and provides resources to the NSG and ASG. An important part of our combined effort is developing open technology standards and procedures to support the widest possible distribution of customized intelligence.

A fully integrated system for the efficient collection, exploitation and dissemination of GEOINT is at the heart of NSG–ASG vision. To fulfill our responsibility, we must first collect the most reliable data. We must then automate the processing of that data to the fullest extent possible, so that our specialists can spend their time managing and analyzing it instead of manually ingesting and collating it. Finally, we must give our finished intelligence the wide access and distribution required to accomplish the mission, with the people that we have deployed across the NSG and with our allied partners.

Robert B. Murrett
Vice Admiral, USN
Director

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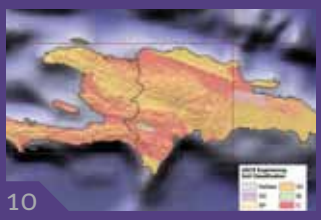

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On the Cover

Everyone and everything on Earth can be associated at a particular moment with a geographic location, which places geospatial intelligence at the center of most intelligence questions. GEOINT puts intelligence into context, providing analytic perspective by answering "What?", "Where?" and "When?" When fused with other intelligence sources, GEOINT's power increases exponentially. Technology makes this fusion possible. The agency maintains ongoing partnerships and research programs to develop and apply new and emerging technologies. Each innovation expands GEOINT's ability to visualize intelligence, rendering an ever-clearer picture. Satellite image courtesy of DigitalGlobe. Cover design by Jason Collins.

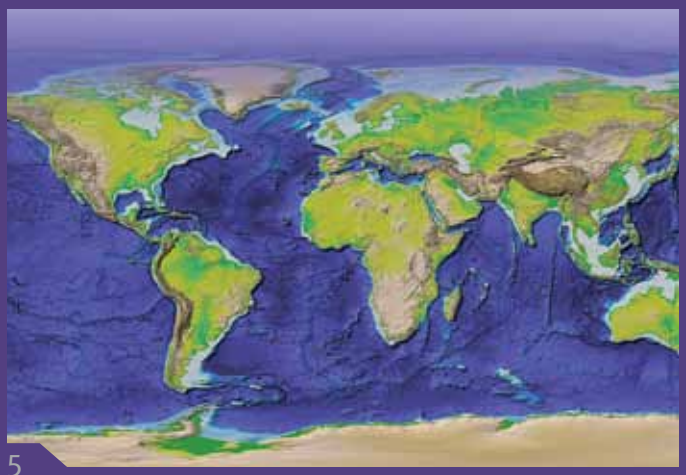

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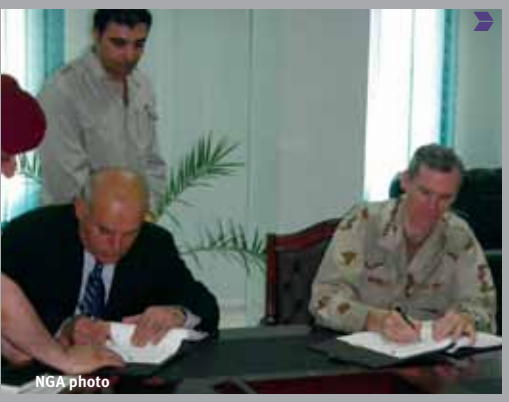
Photo by Rob Cox

NGA Campus East

» When completed, NGA Campus East, the National Geospatial-Intelligence Agency's new headquarters, is expected to exceed the Leadership in Energy and Environmental Design Silver Certification, making it the largest LEED-certified government building in the world. LEED certification recognizes that the project integrates energy-efficient design, resource-efficient construction methods, energy and water efficiency and more.

NGA IN THE NEWS


NGA photo

Iraq, U.S. Agencies Sign Memorandum

On April 7 in Baghdad, the Iraqi Directorate General for Intelligence and Security and the National Geospatial-Intelligence Agency formalized their geospatial intelligence partnership.

The Memorandum of Understanding signed between NGA and its counterpart represents the maturation of an important relationship between these organizations and nations. It underscores the tremendous progress the Iraqi government has made in advancing its GEOINT capabilities.

NGA has worked with the Iraq Ministry of Defence since 2007 to modernize its capabilities to create maps and charts and perform geospatial analysis critical to the safety and security of Iraqi forces. The new MOU reinforces the growing strength of Iraqi geospatial intelligence and provides the framework to continue NGA's support into the future.

NGA photo illustration

Extended Learning Site Opens in Tampa, Fla.

The National Geospatial-Intelligence College formally opened its first Extended Learning Site at MacDill Air Force Base, Tampa, Fla., with a ribbon-cutting ceremony on March 24. The MacDill site is part of the agency's continuing drive to push GEOINT resources forward throughout the National System for Geospatial Intelligence.

The MacDill site will provide tradecraft and leadership training to NGA employees and other NSG members in the region. Personnel from many commands and agencies who attend training at the site will learn to apply GEOINT more effectively to make decisions critical to mission success. Additional sites are projected for other civilian and military locations in the near future.


Photo by Larry Franklin

NGA Marks Earth Day With Tree Planting at New Headquarters

The National Geospatial-Intelligence Agency and the U.S. Army Corps of Engineers held a tree planting ceremony at the NGA Campus East near Fort Belvoir in Springfield, Va., on April 22, to celebrate Earth Day 2010. The ceremony marked the first plantings to restore more than 10 acres with formal landscaping and the planting of more than 3,200 trees and shrubs around the site. NGA facilities in the Washington, D.C., area are consolidating to the new headquarters.

NGA will also be planting 44,000 tree seedlings across the Fort Belvoir North Area, to make sure there is no net loss of trees on the post due to the construction. Other examples of green initiatives at the new headquarters include a pond that captures stormwater and reuses it for landscape irrigation, green roofs over the tunnels between the buildings, low volatile organic compound paints, recycling programs, an energy efficient lighting system and an innovative cooling system.


DIA photo

Secretary Gates Announces Next NGA Director

On Feb. 22, Secretary of Defense Robert M. Gates announced that Letitia "Tish" Long, deputy director of the Defense Intelligence Agency, will become the next director of the National Geospatial-Intelligence Agency.

"Her more than 30 years of engineering and intelligence experience include service as the deputy undersecretary of defense for intelligence, deputy director of naval intelligence and as a coordinator of Intelligence Community activities for the director of central intelligence," Gates said.

Director of National Intelligence Dennis C. Blair stated, "Ms. Long's historic appointment reflects her 32 years of exceptional government service, including more than two decades in the Intelligence Community. She is highly respected throughout the Intelligence Community and Department of Defense."

Long will be the first woman to lead a major intelligence agency when she assumes her new post later this summer.

DIA Director Lt. Gen. Ronald Burgess announced on April 19 that Robert Cardillo, the DIA deputy director for analysis, will become deputy director of DIA when Long assumes her post at NGA. Previously, Cardillo served as director of NGA's Analysis and Production Directorate and Source Operations and Management Directorate.

Blair announced on April 21 that NGA Director Vice Adm. Robert B. Murrett will take over as ODNI director of intelligence staff later this year following the retirement of Lt. Gen. John F. "Jeff" Kimmons.

DOD Designation Advances Reach of GEOINT Visualization Services

By Pamela S. and Jessie Lee W.

As part of a continued commitment to streamline delivery of geospatial intelligence to the warfighter, the Vice Chairman of the Joint Chiefs of Staff designated the National Geospatial-Intelligence Agency to develop GEOINT Visualization Enterprise Services, or GV-ES, as a DOD Shared Enterprise Service. The designation in October 2009 marked the first time an organization other than the Defense Information Systems Agency has been tapped to support the development and deployment of software services for the entire DOD community.

The designation makes NGA the primary provider for visualization services to the DOD and directs that DOD organizations coordinate with NGA for visualization services.

On Feb. 19, NGA and the Marine Corps Intelligence Activity completed the first GV-ES pilot to test the suite's Google Earth™ functionality. The pilot team's objective was to provide a "simple, situational awareness tool that brought together imagery, maps and other data sources to achieve a common operational picture for MCIA," stated Chris C., assistant chief information officer for applications, who led the pilot for NGA. NGA and MCIA plan to validate the suite's operations in theater to better understand the challenges faced by warfighters.

Based on lessons learned from the NGA–MCIA pilot, the NGA Office of the Chief Information Officer is working closely with the Acquisition Directorate's eGEOINT Management Office and the InnoVision Directorate to initially offer expanded GV-ES capabilities that incorporate services and components from NGA's existing GEOINT Visualization Services and NGA's Commercial Joint Mapping Toolkit. NGA has also collaborated with the Naval Research Laboratory, U.S. Strategic Command, DISA and other partners to improve the GV-ES offering.

GEOINT Visualization Services aggregates the best of NGA's resources to deliver rich geospatial content and analysis directly to warfighters, intelligence officers and policymakers via Web-based tools on classified and unclassified computer networks. In addition to visualization capabilities, the suite includes analytic tools and data services.

The Commercial Joint Mapping Toolkit distributes GEOINT through the Internet by a single scalable and adaptable open source system that incorporates industry standards. It has been adopted as the standard geospatial production tool for DOD command, control and intelligence systems. P

Pamela S. is a contractor supporting the eGEOINT Management Office.

Jessie Lee W. is a contractor supporting the Office of the Chief Information Officer.

DOD Photo

Digital Bathymetry Enriches Topographic Intelligence

By Gary W.

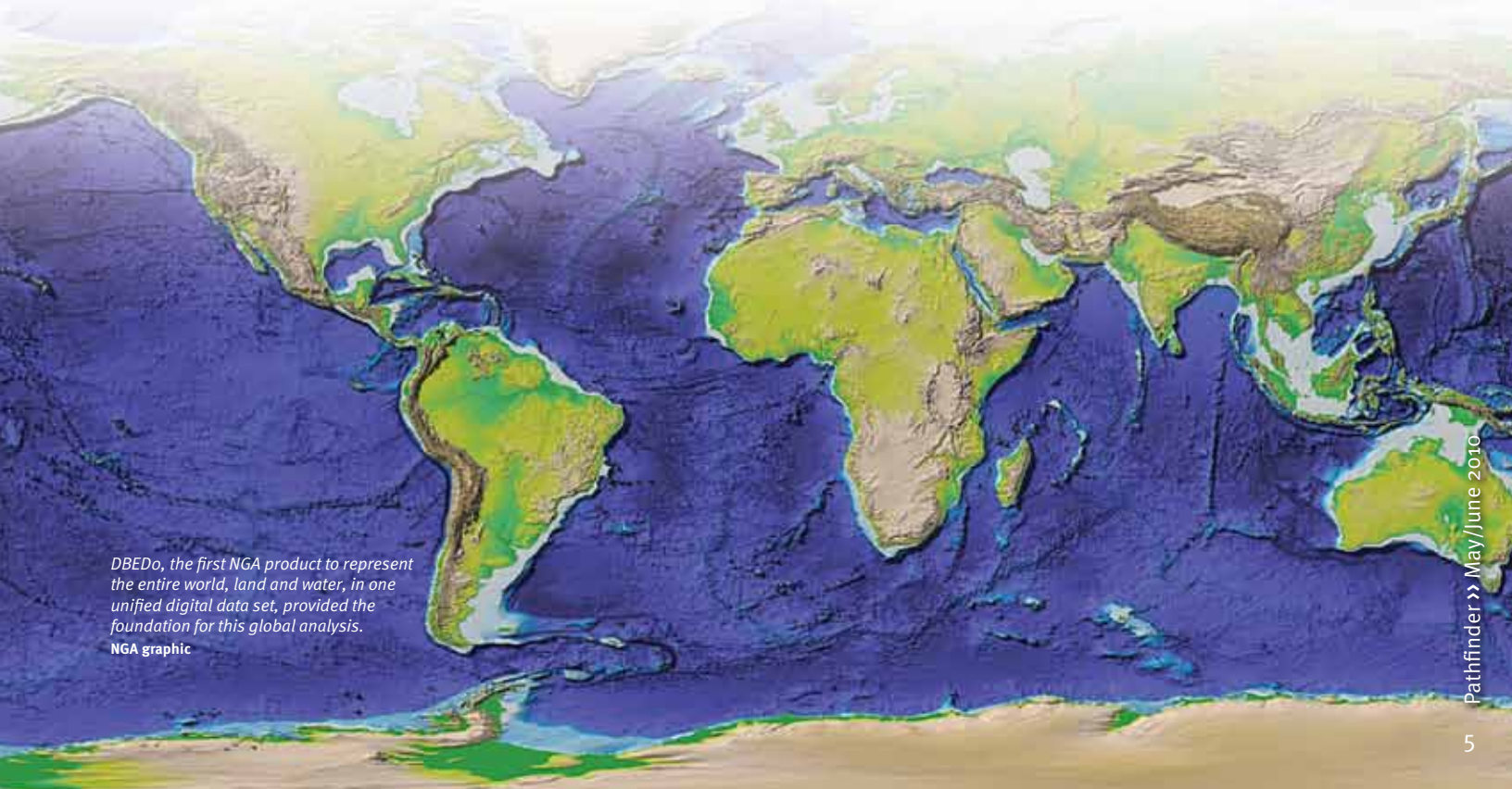
It is estimated that less than 25 percent of the world's oceans have been systematically surveyed, with only 5 percent to a required GPS accuracy. For the last several years, the National Geospatial-Intelligence Agency's Office of GEOINT Sciences has used open source technology to build bathymetric data sets that bridge the gap between water and land. For the first time NGA can now offer a global ocean–land elevation product.

Topographic intelligence is a foundation of mission tactical models, deployment planning and navigational tools that require worldwide elevation and bathymetry information. As the geospatial intelligence, or GEOINT, provider for the Department of Defense and the Intelligence Community, NGA has developed a global, uniform matrix of digital bathymetry and elevation information. This Digital Bathymetry and Elevation Data Level 0 (DBED0) data seamlessly represents the positive and negative heights of the Earth's physical surface above and below the oceans, enabling applications to derive slope and surface roughness details.

Many kinds of GEOINT are based on elevation models, and NGA studies how new data sources can improve existing data. While updating the geodesy databases from Digital Terrain Elevation Data (DTED®) with higher-resolution Shuttle Radar Topography Mission (SRTM) data, NGA noticed a disparity between terrestrial and hydrographic data coverage. Initially combining bathymetric data holdings from the NGA maritime database and the NGA geodesy database produced an initial database with 50 million bathymetry records. Whereas terrestrial data was recorded well overall, far more data points were needed to accurately represent the ocean floor.

Open Source Data Mining

Given that NGA's Maritime Services was already working with the U.S. Navy to obtain bathymetry data, the Office of GEOINT Sciences explored the availability of data stores at other federal agencies and at research organizations. Contacts were established with the National Oceanographic and Atmospheric Administration's National Geophysical Data Center, the U.S. Geological



DBEDo, the first NGA product to represent the entire world, land and water, in one unified digital data set, provided the foundation for this global analysis.
NGA graphic

Survey, and research institutes such as Scripps Research Institute, Lamont-Doherty Institute, Woods Hole Oceanographic Institution and several foreign partners. These contacts led to international sources, many of which provide open, searchable databases of bathymetry data at no charge, as well as digital elevation models. After just a few years of collection, the agency's Maritime Services and Office of GEOINT Sciences had gathered billions of global bathymetry records.

Early on in the open source collection, NGA addressed the challenges of managing the vast amount of data associated with a typical bathymetric survey. First, knowing that NGA couldn't store and exploit all of the data, the Office of GEOINT Sciences decided to keep the vertical, or single, beam bathymetry data and thin the multibeam bathymetry data to the essential data needed. This decision reduced the data volume to just over a billion records.

A view of the Arctic Ocean and North Pole based on DBED0. Economic zones and exploration rights are just two issues affected by proper bathymetric representation of the oceans.
NGA graphic

A second challenge involved merging over 100 bathymetry survey sources that were unlinked and unrelated—a challenge identical to one faced by NGA and its predecessors in processing gravity survey data from unlinked, unrelated sources for the past 40 years. Analysts modified gravity software programs to handle the bathymetry data and implemented quality control methods for identifying bad data and producing source accuracy statements.

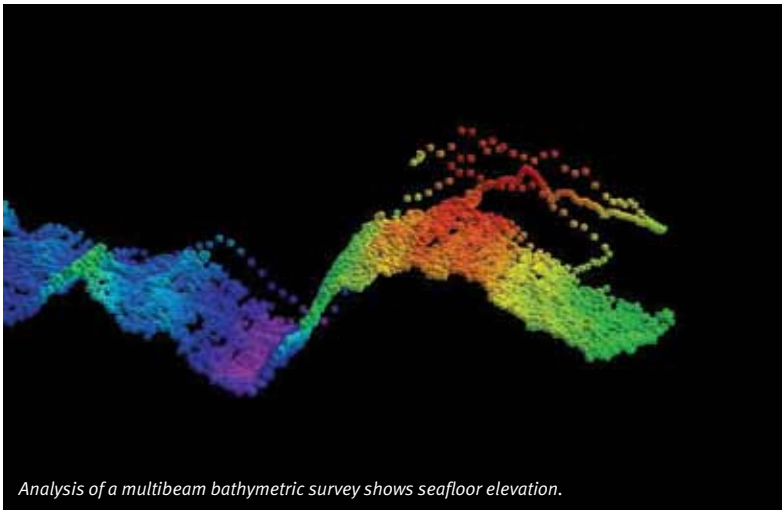
Creating a World Model

Though NGA's bathymetric data holdings grew from 50 million to more than 1.5 billion analyzed bathymetry records, there were still vast areas of the world's oceans missing data. To aid in filling these gaps, NGA exploited a mathematical process developed by NOAA and Scripps that uses satellite altimetry sea surface height information to predict large general features of the ocean floor. Though not as accurate as bathymetric data, the process yielded general feature information.

The agency is now using this product as the foundation for many regional and other mapping products. Additionally, in 2007, the U.S. Navy requested a seamless global set of elevation and bathymetric information to support a contractor war games simulation program. While the war games simulation world had beautiful colored topography representation built from DTED and SRTM elevation data, a single blue color depicted all oceans, seas, bays, and inlets due to the lack of bathymetry information.

The collaborating interagency team decided that a global product similar to DTED Level 0 would satisfy the needs of the Navy's war games simulation and match NGA's ability to provide a data set with a reasonable level of accuracy. The current NGA DTED0 product is 30-second-spaced land elevations in one-degree cells. Of the 64,800 one-degree cells covering the Earth, only about 19,000 are land cells. The other 46,000 one-degree water cells were never created. Using a combined SRTM land-water model and NGA's World Vector Shoreline, NGA populated all of the 30-second land posts into the DTED0 format.

Incorporating the bathymetry data was more problematic because the spacing between data points varied from less than 30-second spaced bathymetry data to areas of voids greater than 10 kilometers. Analysts applied a variety of mathematical algorithms to predict the 30-second point bathymetry and fill the voids. The satellite altimetry sea surface bathymetry prediction was also applied. Finally, all 64,800 one-degree cells were filled with either land elevations or bathymetry information. The DBED0 was complete.



Analysis of a multibeam bathymetric survey shows seafloor elevation.

NGA graphic

The DBED data is stored in the DTED0 format according to military specifications. It allows for a full representation of the Earth's physical surface for general modeling, mission planning and assessment activities. Such reduced-resolution data is not intended and should not be used for automated flight guidance or other safety of navigation instruments that require a more stringent precision standard.

Available to government users from the Defense Logistics Agency, the DBED0 data has been positively received by the Navy's war games project and the U.S. Naval Surface Warfare Center. The result of this endeavor was the creation of NGA's first truly seamless model of the entire topographic surface of the Earth. By combining open source bathymetry collection, computer algorithms, new math models and analysts' expertise, NGA has generated a new picture of the Earth.

Gary W. is a geodetic scientist in the Office of GEOINT Sciences.

NGA Strengthens GEOINT for Future Aircraft Carrier

By Laura L. Lundin

The National Geospatial-Intelligence Agency is working with the U.S. Navy on future programs that rely on geospatial intelligence technologies and products to support safety of navigation and warfighter missions.

The criticality of GEOINT to so many missions requires that current platforms be compatible with future technologies and capabilities so that they address and support the mission needs over the life of the system. Because warfare systems programs take so long to build and experience unprecedented longevity, establishing the requirements and standards up front is crucial.

The Office of Future Warfare Systems is the lead NGA component working with Navy developers on a long list of emerging and future naval programs, with one of the most prominent being the CVN 21. "The CVN 21 program is the future aircraft carrier replacement program for USS Enterprise and CVN 68, or Nimitz class, aircraft carriers," according to the Navy fact sheet.

These Gerald R. Ford Class aircraft carriers, scheduled to be delivered in 2015, will serve as a premier asset for crisis response and early decisive striking power in a major combat operation. Ensuring the right technologies are in place to sustain the viability of critical geospatial intelligence products is key to the success of the carriers' mission.

"The office supports the development of the CVN 21 program by establishing connections with the program manager and system developers to ensure that their GEOINT needs are fully understood as the program works its way through the defense acquisition process," said the project lead for NGA's involvement.

This interaction is further extended to the Department of Defense, where the NGA team guarantees that necessary standards and requirements are in place to meet future compatibility requirements between NGA's GEOINT products and Navy systems.

The CVN 21 program will use GEOINT in several ways, such as supporting the ship's electronic navigation system with the agency's Digital Nautical Chart. These products allow the CVN 21, as well as the rest of the fleet, to safely navigate on oceans worldwide.

"One benefit of our working relationship is that NGA receives early and continuing visibility into the CVN 21 program requirements and characteristics," the NGA project lead, said. "This visibility helps NGA leaders decide and set GEOINT priorities."

As a result, NGA is set to provide aeronautical data, detailed topographic data imagery, imagery intelligence and targeting data products to the Navy's carrier battle group in support of U.S. and coalition operations.

"The CVN 21 program receives an in-depth understanding of NGA plans for future availability of different types of GEOINT, and this involvement allows all stakeholders to identify potential GEOINT requirements and gaps early in the life of the program, while solutions are still affordable and implementable by all parties," said the NGA project lead.

For the CVN 21 program, NGA supports the Navy's Distributed Common Ground System, or DCGS-N, and the Electronic Chart Display and Information System, or ECDIS-N. The DCGS-N is the Navy's intelligence, surveillance, reconnaissance and targeting

Commissioned in 1975 and the first aircraft carrier of its class, the USS Nimitz departs San Diego. NGA is working with the U.S. Navy to fully meet the GEOINT needs of the next class of carriers currently in production.
U.S. Navy photo

system, which consists of multi-intelligence dissemination to a variety of enterprise segments. The ECDIS-N is used for electronic navigation and includes platform display application software and electronic chart data.

The first class of the CVN 21 program, USS Gerald R. Ford, is expected to deploy in 2016, and NGA will support the carrier with GEOINT throughout its operational life. Northrop Grumman Shipbuilding Newport News has been building the carrier since late 2008, but NGA's involvement began in the development phase in 2005.

"We recently traveled to the Virginia Advanced Shipbuilding and Carrier Integration Center in Newport News, Va., to meet with lead engineers on the program," said the NGA project lead. Now, the team engages with the Northrop Grumman chief engineers on functions such as navigation systems, electronic charting and carrier mission planning systems. Regular interaction and updates provide the opportunity to develop strategies to incorporate GEOINT technologies needed for success.

The Future Warfare Systems office is closely involved in identifying and addressing GEOINT areas of need and improvement in a variety of emerging systems. By working with the Navy and the National System for Geospatial Intelligence, which serves as an integrated, collaborative community of GEOINT professionals embedded with operational and national partners, the office ensures military and intelligence mission needs are met.

The office continues to work with other major defense acquisition systems that depend on GEOINT to ensure that NGA data is available and accessible for all mission requirements.

Laura L. Lundin is a public affairs officer in the Office of Corporate Communications.

GEOINT for Future Littoral and Riverine Programs

The Littoral Combat Ship is another example of NGA's Office of Future Warfare Systems involvement in an emerging naval system. The LCS is a relatively small surface vessel intended for operations close to shore and in shallow water, otherwise known as the littoral zone.

"These vessels rely on GEOINT data to safely navigate in shallow water," said Lt. j.g. Justin Sever, with NGA's Future Warfare Systems. However, "Like some other warfare systems, the LCS is also used as a source of collection, as it can collect bathymetry data from LCS sensors while underway, benefiting the entire GEOINT and National System for Geospatial Intelligence community."

Bathymetry involves measuring and collecting data on the depth of ocean floors to determine bottom topography. These depths are depicted as contour lines on nautical charts and on an Electronic Chart Display and Information System.

Continuing a process of collaboration, NGA's Maritime Services, assisted by the Future Warfare Systems office, addressed shortfalls in these littoral areas, and the Littoral/Riverine Steering Group is leading the development of a production program for collecting and producing GEOINT data in littoral and riverine areas to support future naval system programs requiring shallow water data, such as the Expeditionary Fighting Vehicle, Virginia Class Submarines, and the LCS.

"Recently, the NGA's Safety of Navigation Working Group recommended the NSG leverage technology to update safety of navigation data and produce actionable GEOINT," Sever said. Since the NSG serves as an integrated, collaborative community of GEOINT professionals, its leveraging of these technologies is vital to planning and meeting maritime operational needs.

The working group also recommended modernizing global safety of navigation maritime databases to comply with NSG standards, improving the collection, storage, maintenance and dissemination of safety of navigation data.

Coordination based on knowledge and information sharing between NGA, NSG, Navy and other mission partners will ensure the best data is available for GEOINT products in the future.

Modeling Natural Surface Motion Mitigates Risk

By Dr. David B.

Many people view the natural environment as essentially unchanging, giving deference only to seasonal differences and periodic meteorological events. However, those who interact with the Earth by studying rocks, soil and vegetation understand that the natural environment is constantly in motion, at times shifting and adjusting with potentially deadly outcomes.

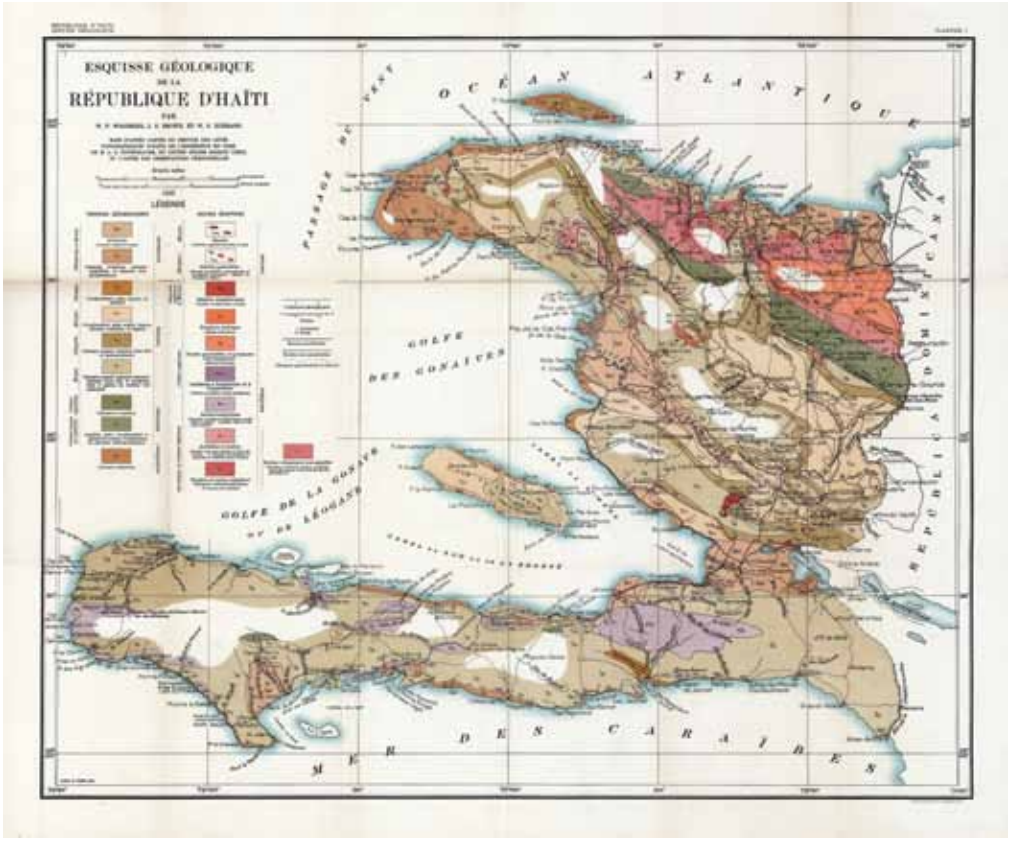
Such an outcome was witnessed recently in Haiti, where the devastating environmental effects of the January earthquake are still being assessed. A National Geospatial-Intelligence Agency team has been modeling changes in the Earth's surface to enable more rapid responses to potential crises in the Caribbean and elsewhere. By 2012, the agency plans to have modeled the entire globe.

Depicting Haiti's Environmental Vulnerabilities

In response to NGA's support to the ongoing relief efforts in Haiti, a team of geodetic scientists from the agency's Source Operations and Management Directorate, Office of GEOINT Sciences, used geotechnical modeling to depict environmental situations that could compound problems in the region. The team provided soil data, used for engineering and agriculture, for the island of Hispaniola, and products characterizing the terrain by flood potential and the percentages of sand, silt, clay and gravel.

Using scientific methods and mathematical models to predict the behavior of the Earth, the team's geotechnical modeling helped organizations planning relief efforts to determine population mobility patterns, locate makeshift camps and analyze natural and environmental hazards. For example, the team assisted the National Center for Medical Intelligence and other NGA analysts to identify areas vulnerable to erosion, landslides and floods during the approaching rainy season. Camps identified as vulnerable could then be moved to other locations to mitigate risk.

Understanding the value of geotechnical modeling for predicting, preventing or mitigating damage caused by natural hazards associated with the Earth's terrain and movement, the NGA team equipped decision makers with geospatial intelligence tools to determine current and future needs to assist in relief efforts.

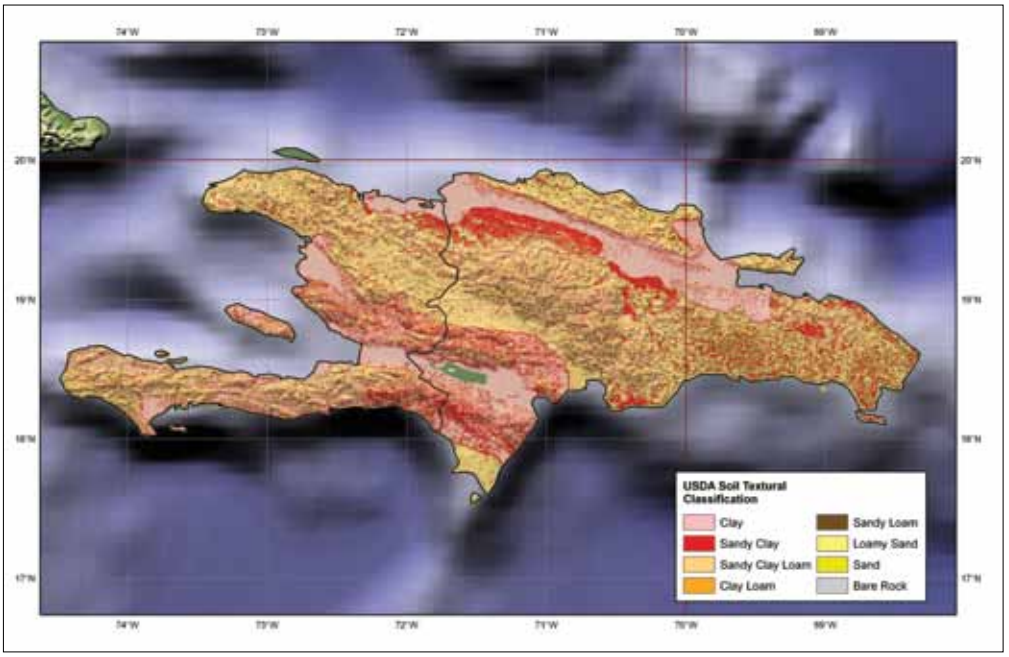


Geological Survey of the Republic of Haiti.
From Geology of the Republic of Haiti by the Geological Service of the Republic of Haiti, 1924

Creating Effective Geotechnical Models

While maps depict a geographic area at a single moment, crisis operations demand current, in-depth data that account for dynamic environments, making imagery and other remote platforms ideal for monitoring the changing ground conditions over a sequence of time. The team took these capabilities and fused them with all-source information and spatial elements to create a multidimensional understanding of what was taking place on the ground.

For example, looking individually at an area's sedimentation, local temperature, precipitation trends and vegetation limits the overall perspective of what changes are occurring as well as what could occur. However, combining those elements with imagery and complementary all-source information results in a geotechnical model that allows for a more in-depth analysis and greater understanding of what the future needs of an area might be.



Geotechnical soil modeling based on the U.S. Department of Agriculture soil textural classification.
NGA graphic

Effective geotechnical models assess what is known about an area as well as what can be inferred. The team uses all available resources, including open-source data, to describe the environment. These resources are combined with other information, such as elevation data, imagery and terrestrial geophysics, to form a mathematical model. Global data sets, which represent climate, soils, geology and vegetation, are then established as a base from which products are developed.

To create a model, the data used must first be evaluated and translated into the universal language of mathematics. The resulting data sets are applied to an X, Y, Z data series where the Z component consists of the data of interest, with X and Y representing geographic coordinates. Using this process, hardcopy data can be readily converted into any desired format and reprocessed to conform to fundamental principles of physics and natural systems.

The fusion of all-source data within a spatial domain is both flexible in application and adaptable in scope. The process can be tailored to the GEOINT objective for any given area or mission, effectively contributing to the knowledge base necessary to address an issue through a geographic information system and provide a comprehensive GEOINT solution.

Demonstrating the power of geophysical surface modeling through GEOINT has proven invaluable to many of NGA's partners over the past two years. In addition to models for those operating in Haiti, the NGA team has built and enhanced geotechnical models of Afghanistan, Iraq, the Korean Peninsula and other areas.

Understanding the effects of changing environmental patterns helps NGA to prepare its partners to meet global humanitarian needs and address potential operational issues related to the Earth's surface. NGA stands ready to help, whether the need is predicting or responding to natural disasters or answering related GEOINT questions for those in theater. P

Dr. David B. is a geodetic scientist in the Office of GEOINT Sciences.

GeoTASER Offers Online Solution to Geotagging

By Jean-Pierre M.

For analysts with the National Geospatial-Intelligence Agency, being able to visually reference geographic locations that are identified in documents ranging from raw to finished intelligence is a vital piece to creating valuable, effective geospatial intelligence products.

But the traditional application of this process, known as geotagging, is typically tedious and cumbersome, often taking away valuable time resources needed for analysis.

Imagine an analyst sitting at a desk, pen and reference materials in hand, reading massive amounts of information, searching for clues about various locations, which can often include obscure city and street names, finding those references, looking up the geographic name in a directory or gazetteer, and manually assigning geocoordinates. The analyst then transfers that information into another application to create visual reference points and analyze the potential connections.

Repeat those same steps for every location identified in the document.

Now envision that same analyst pulling that information digitally by simply clicking a button and having the names of locations in the document automatically convert to visual plots.

The NGA InnoVision Directorate's Knowledge Management Web 2.0, or KWeb, team, has created GeoTASER to make this online solution a reality.

Short for Geospatial Tagging and Extraction Service, GeoTASER combines several knowledge management-related capabilities and data sources. These include text extraction, database services, gazetteer services and place name data from NGA, Defense Intelligence Agency and U.S. Geological Survey sources.

While analysts come across location names daily as they read media articles, websites and intelligence reports, coordinates are not easily available but are necessary to ensure intelligence products are understood and used to their maximum extent.

By making the geotagging process semiautomated, GeoTASER frees analysts to spend more time on analysis and aids in identifying intelligence connections based on locations that might have been previously overlooked.

GeoTASER is the first KWeb online service for use by analysts and operators working anywhere in the National System for Geospatial Intelligence. Users include deployed military personnel, analysts at partner agencies and NGA support teams.

InnoVision strives to develop technologies to automate or streamline some of the many analytical processes employed by NSG analysts. Developing GeoTASER was no exception to this vision. By collaborating with customers and mission partners, the team used research and development experience to answer this critical analytical need while incorporating feedback from the users throughout the process.

Demonstrating how combined commercial software and government databases can improve the efficiency of the analytic process, GeoTASER is currently an InnoVision operational prototype and is in transition to become a program of record.

For geospatial intelligence analysts, products like GeoTASER are invaluable tools to understanding what is happening on Earth and why. This understanding increases confidence in the GEOINT products provided to ensure the success of humanitarian, national security, defense and intelligence missions across the globe. P

Jean-Pierre M. is a retired U.S. Army colonel working as a contractor supporting the KWeb team as a senior staff analyst.

Satellite image courtesy of DigitalGlobe

Aereon Promises Faster Event Detection and Notification

By Debbie H.

Aereon, the National Geospatial-Intelligence Agency's event detection, data correlation and alerting service, will soon allow users throughout the Department of Defense and the Intelligence Community to automatically correlate and identify critical domestic and international activities across a vast number of data sources. This service helps analysts increase productivity, improve accuracy and fulfill the agency's mission more efficiently by placing the management and control of search criteria in the hands of analysts.

Aereon detects and automatically transfers relevant all-source information across multiple secure systems to support geospatial intelligence analysis. Using keyword and temporal searches, Aereon constantly tracks and updates whatever an analyst is seeking.

In conjunction with NGA's Palanterra™ Web application, an agency analyst used Aereon during the Nuclear Security Summit held April 12-14 in Washington, D.C. The service tracked live events and monitored news services and other feeds, as required with many National Special Security Events. Aereon then sent this information directly to the analyst's workstation.

The service automatically sends the information from unclassified to classified systems without intervention from the analyst. This enables the analyst to view geographically referenced activities or geospatial intelligence via the 2-D browser-based Palanterra™ and 3-D tools like Google Earth™ and ESRI's ArcGIS Explorer.

During the 2010 Winter Olympics, analysts used Aereon's suite of tools to record day-to-day events to form a common operating picture accessible by anyone who needed the information. These events were captured as real-time sources and event feeds and pushed to the relevant systems. This capability significantly increased cross-community collaboration.

Aereon continuously observes and evaluates data events from traditional sources such as databases and message queues, as well as from Web services, RSS feeds, geospatial resources and other sources. Analysts can set up criteria to monitor and analyze multiple event feeds for specific patterns or correlate event activities across time windows.

Official White House photo by Chuck Kennedy

Aereon:

- Ensures that appropriate information is easily shared with individuals or groups at various security classification levels
- Supports the preservation of knowledge and experience by allowing analysts to share search criteria throughout the agency and across the DOD and Intelligence Community
- Identifies unique relationships occurring across multiple data sources to identify unforeseen conflicts or crises
- Provides alerts that support core geospatial questions to allow a flexible response drawing from the agency's diverse geospatial resources
- Discovers Web feeds, such as RSS or GeoRSS, and data files, such as KML, that can be used by other software programs

Comprehensive and user-friendly for nontechnical personnel, Aereon is proving a valuable tool for NGA's analysts. No matter the event, the service makes analysts more efficient and effective at exploiting a variety of data from today's Web-centric world. P

Debbie H. is a system engineer in the Acquisition Directorate.

Agency Tests GEOINT Printing for the Field

By Craig F.

Analysts and partners of the National Geospatial-Intelligence Agency may soon have a new tool for printing maps and geospatial intelligence products under stringent specifications in the field.

The NGA Enterprise Operations Directorate Mission Management Division is developing a method to produce hardcopy printing that does not compromise the quality NGA's customers expect. The division provides these products and other services through the Forward Based GEOINT–Remote Services unit formerly known as Remote Replication Services.

Getting information to warfighters and deployers in a timely manner has been NGA's goal since its inception. GEOINT is available in both digital form and hardcopy. Because of weight, bulk and logistical issues, hardcopy has always been the most difficult to deliver to the field. With the advent of digital maps, charts and imagery, delivery of GEOINT became more efficient, and in-theater hardcopy printing became practical. However, all of the military specifications could not be met.

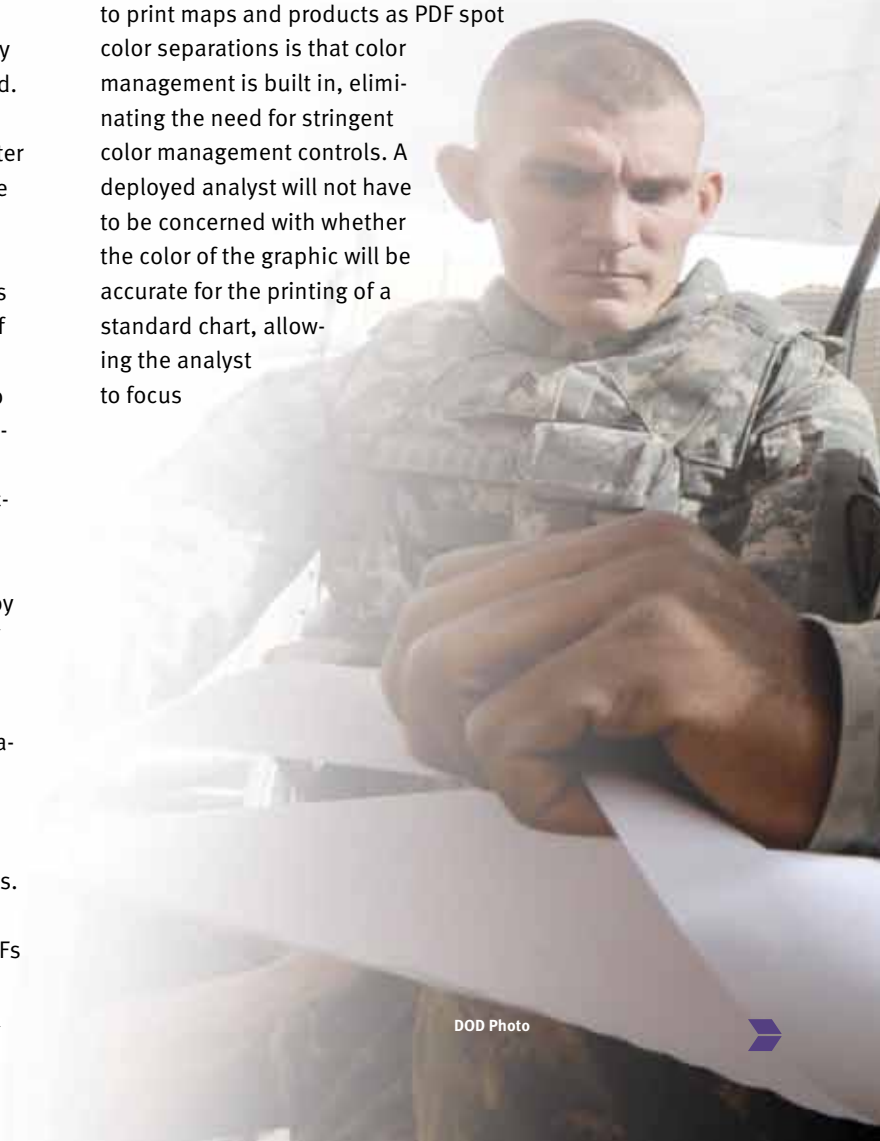
Lithographic technicians from the Mission Management Division started looking at available technologies that would allow hardcopy printing for specific areas of interest. Technicians reviewed requirements for paper, ink and color visual efficiency and determined a way to incorporate those specifications into existing technologies. These results helped produce the first military specification large-format plotter, used for printing vector and raster graphics, now under beta testing within NGA's Arnold, Mo., facility.

Technicians are in the final phase and hope to deploy the capability later this year. The system will consist of a workstation containing an area-of-interest specific PDF database of maps and charts with a raster image processor (RIP), which converts a PDF's spot color separations into pixels or bitmap files, and a set of plotters optimized for printing to military specifications.

Capability testing has shown that the quality level mirrors what can be produced from a lithographic press. This is achieved by using simple technologies incorporated within PDF files, RIPs and spot color inks. The PDFs contain color place holders in separate layers. The RIP identifies and directs specific layers to a spot color ink cartridge within the large-format plotter. This allows a particular layer, or separation, such as drainage, contours or aeronautical features to be printed to NGA visual standards.

Directing each of the graphic's individual features to a specific color reduces printing time on the plotter by nearly a third over four-color printing. Ink consumables are also reduced as most features are printed by one color instead of a series of colors. Printing line art graphics, such as maps and charts, on the same plotter with today's four-color configurations forces the consumer to spend more than necessary on ink.

Another benefit of optimizing a large-format plotter to print maps and products as PDF spot color separations is that color management is built in, eliminating the need for stringent color management controls. A deployed analyst will not have to be concerned with whether the color of the graphic will be accurate for the printing of a standard chart, allowing the analyst to focus

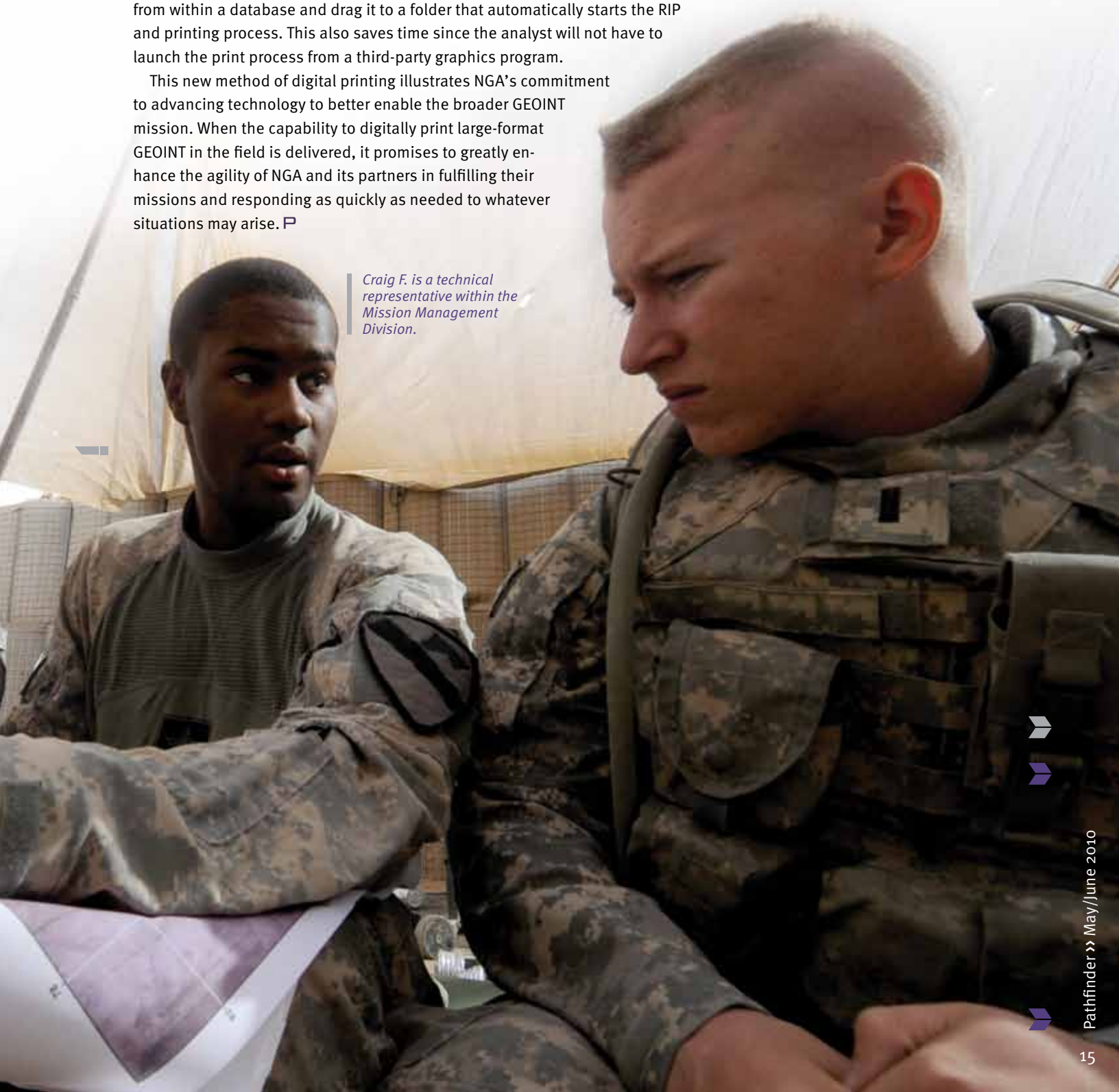


DOD Photo

on customer support rather than maintaining printer calibrations. Since the PDFs contain separate color layers, an analyst would only be required to locate the file from within a database and drag it to a folder that automatically starts the RIP and printing process. This also saves time since the analyst will not have to launch the print process from a third-party graphics program.

This new method of digital printing illustrates NGA's commitment to advancing technology to better enable the broader GEOINT mission. When the capability to digitally print large-format GEOINT in the field is delivered, it promises to greatly enhance the agility of NGA and its partners in fulfilling their missions and responding as quickly as needed to whatever situations may arise.

Craig F. is a technical representative within the Mission Management Division.



Interpreting Services Affirms NGA's Commitment to People

By Katherine Whitaker

Achieve: Invest in, and Challenge, a more Diverse and Expert Workforce.

NGA invests heavily in technology. Geospatial intelligence relies on it and always will. However, of far greater importance are the people behind the innovations. Even the best technology is of little worth without those who research, develop, implement and exploit it.

This agency values its personnel above any technical advances, relying on its people to build and manage each generation of new technologies. NGA strives to hire and retain an expert work force, indiscriminate of race, gender, background or disability. The agency is committed to meeting the needs of those within its work force who require special accommodations.

For example, NGA employs one of the highest percentages of deaf and hard of hearing employees throughout the federal government, according to the NGA Interpreting Services Program manager.

The Interpreting Services Program provides sign language interpreters as a reasonable accommodation to NGA employees, visitors and applicants. In fact, the demand for sign language interpreting services is the highest of all reasonable accommodation requests at NGA.

"NGA's sign language interpreters, as a group, are tasked with an average of five to eight interpreting assignments per day," said the agency's Reasonable Accommodation Program manager, who works closely with Interpreting Services. Interpreting assignments include everything from one-on-one meetings to conferences.

The American Sign Language fingerspelling for "NGA."
Photos by Thinkstock

The Office of Diversity Management and Equal Employment Opportunity manages both the Interpreting Services Program and the Reasonable Accommodation Program.

"NGA has a large population of deaf and hard of hearing employees; therefore, interpreters do a lot of running around to meet the needs of the community," said one of the agency's sign language interpreters. "It is often fast-paced, but exciting."

"The Reasonable Accommodation Program has a huge EEO impact; it allows NGA to recruit and retain talented employees with diverse perspectives to better support the mission," stated the Reasonable Accommodation program manager.

The sign language interpreter added, "Interpreting Services remove the barrier of communication, having a direct impact on a deaf or hard of hearing employee's ability to succeed in the workplace. We work hand in hand to ensure that deaf and hard of hearing employees have the resources needed to advance and meet the agency's mission."

The interpreter, who has been with the government full-time for over a year, learned to sign while growing up in order to communicate with his grandfather, who is deaf.

"I didn't sign a lot, nor well, so I took some sign language classes at the Scranton State School for the Deaf. I then majored in ASL [American Sign Language] and English Interpreting at Bloomsburg University," he said. "I thought interpreting sounded like a cool career, so I decided to give it a try. And here I am."

The effective development and application of technology require exceptional people. The Reasonable Accommodation and Interpreting Services programs demonstrate the agency's determination to hire and employ the best talent NGA can find, despite perceived limitations.

Katherine Whitaker is a public affairs officer in the Office of Corporate Communications.

Pendulums, Partnerships and Geodetic Principles

By Dr. Gary E. Weir

During the long, hot summer of 1936, young professor Maurice Ewing of Lehigh University sat in a humid U.S. Geological Survey laboratory in Washington, D.C., trying to repair and reassemble a rusted and damaged instrument critical to the science of geodesy, the field of geophysics that seeks to measure and represent the Earth, including its gravity. One of the pioneers of geophysics in the United States, Ewing had to restore to working condition the gravity measuring apparatus invented by the Dutch geodesist Felix Andries Vening-Meinesz.

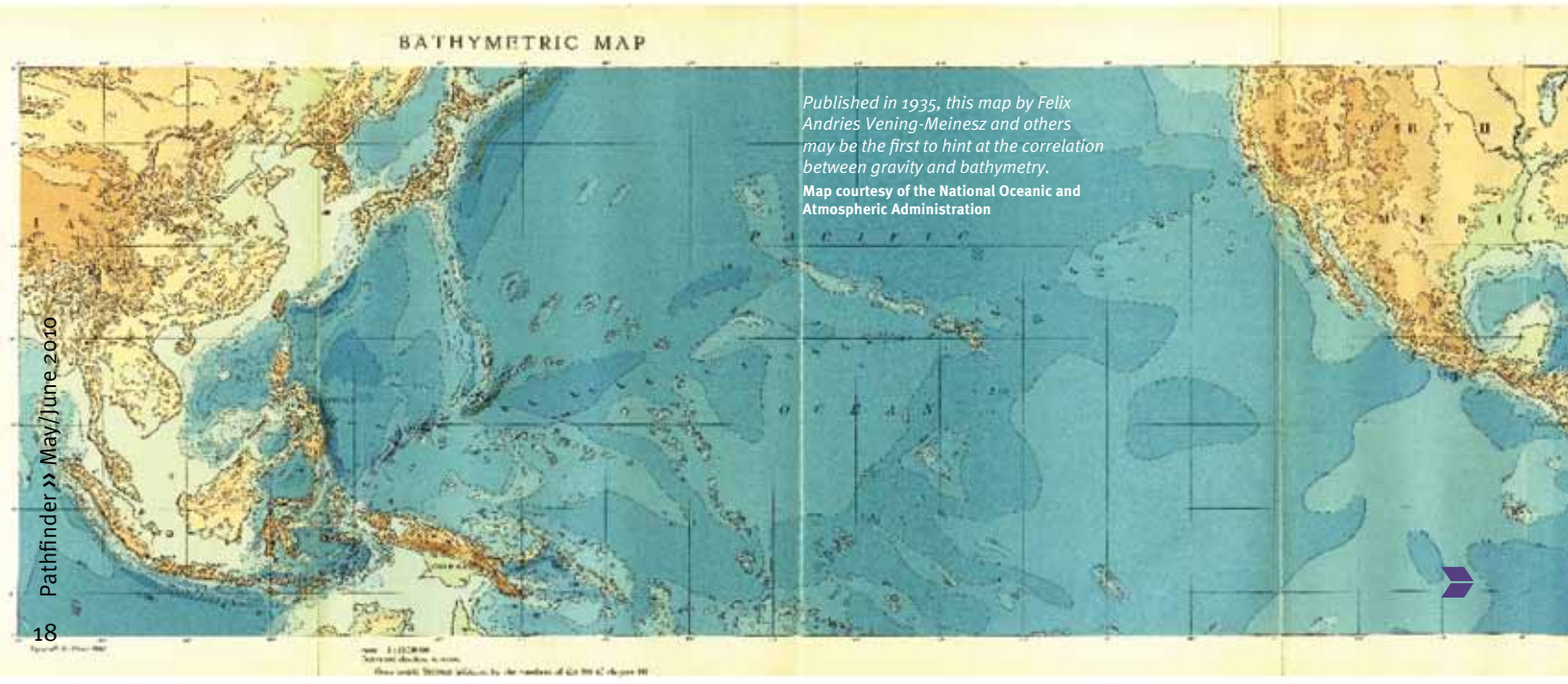
The latter had used the device to make seminal measurements of the Earth's gravity while on board Dutch submarines in 1923 and 1926 and then more recent observations in the Gulf of Mexico on board the submarine USS S-21 in 1928 with American colleagues Fred Wright and Elmer Collins. They used submerged submarines to control roll, pitch and yaw at sea, providing a very stable surface for the instrument, which relied upon mirror-clad swinging pendulums to record their motion on photographic film.

Ewing finished his work with help from Vening-Meinesz by correspondence just in time to join Princeton's Harry Hess, Lt. A.J. Hoskinson of the U.S. Coast Guard and the U.S. Navy's Capt. Lamar Leahy on board the submarine USS Barracuda to take gravity measurements in the Caribbean Sea and West Indies. This successful venture, called the Navy–American Geophysical Union Expedition of 1936, demonstrated the early and mature partnership between the American defense community and gravity research in the United States.

In the American experience, geodetic research and discovery have frequently occurred in collaboration with the military. The latter needed an understanding of the Earth's gravity to plan everything from general navigation to the effective use of ballistic weapons, accurate surveying and the best and safest use of aviation assets.

In the first half of the 20th century, international scientists sought to understand fundamentally the variations in the Earth's gravitational field, thus the areas chosen for exploration. In the case of Ewing, Hess and their colleagues, the anomalies near Puerto Rico and its neighboring submarine trench presented some fascinating challenges. With World War II and the Cold War era that followed, a comprehensive geodetic picture of the entire planet became critical, both for a scientific understanding of the world and for national defense.

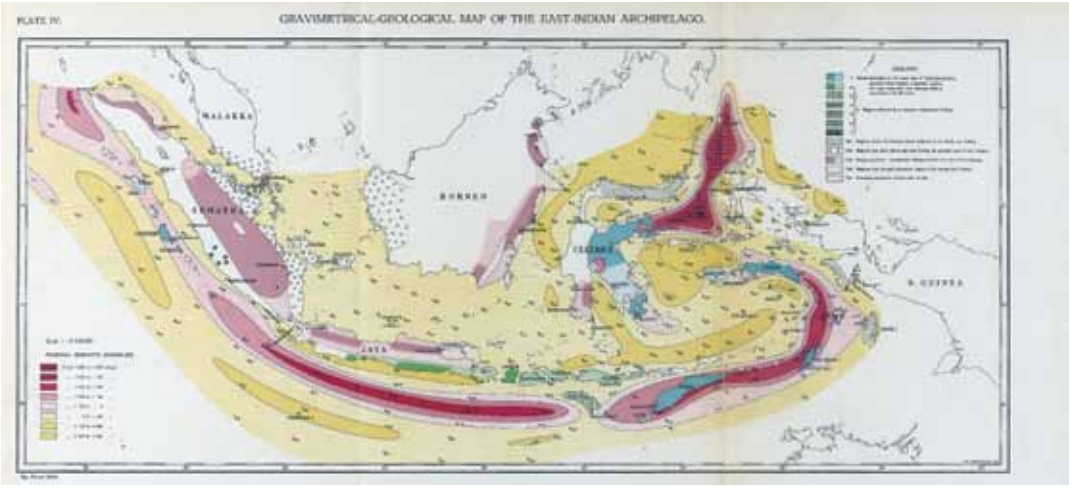
During the 1950s the need for a World Geodetic System (WGS) became obvious in the face of the bipolar tensions and the possibility of war between the United



Published in 1935, this map by Felix Andries Vening-Meinesz and others may be the first to hint at the correlation between gravity and bathymetry.

Map courtesy of the National Oceanic and Atmospheric Administration

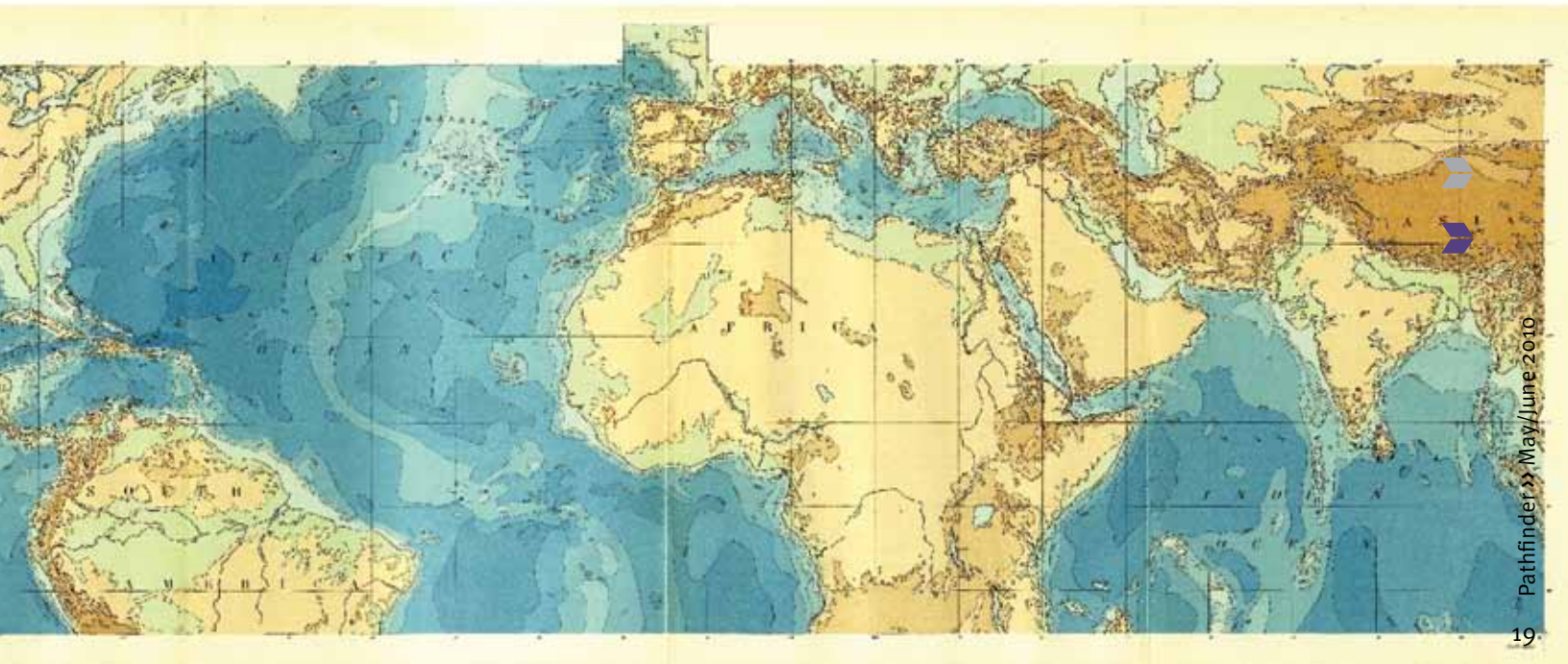
States and the Soviet Union. These conditions created a pressing need for global maps to provide geographic knowledge and to support targeting, navigation and aviation. Add to these requirements the advent of the space race and ballistic missiles after the launch of Sputnik in 1957, and the inability of the larger existing geodetic systems to provide a truly accurate global picture made the development of a new WGS a natural next step.



Felix Andries Vening-Meinesz and others showed the locations of gravity profiles in the world ocean in this map published in 1935.
Map courtesy of the National Oceanic and Atmospheric Administration

As the decade ended, the international scientific community, in collaboration with the U.S. Department of Defense, began the process of combining existing systems and re-referencing them to an ellipsoid model, which represents the Earth's land surface as essentially smooth, rather than the geoid, which represents the Earth's surface as the mean sea level. This effort led to the World Geodetic System of 1960 (WGS 60).

In subsequent years, the addition of new data sets from around the world and new systems of geodetic data collection from satellites and other platforms made improvements possible and occasionally altered the WGS and the gravity model upon which it rested, eventually resulting in the current WGS 84. On April 17, 2008, the National Geospatial-Intelligence Agency implemented Earth Gravitational Model 2008 to improve the use of



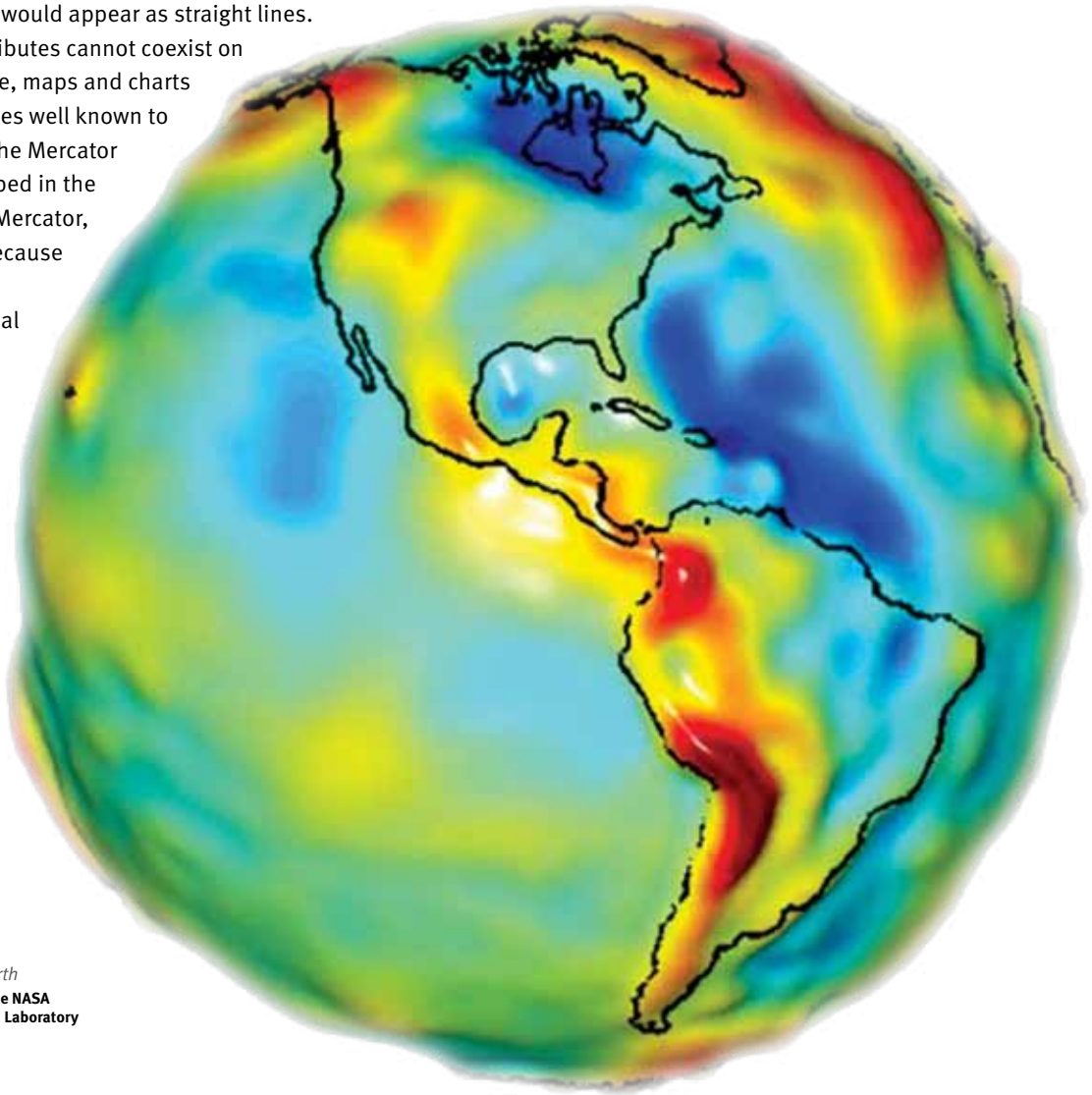
WGS 84. The new gravity model can operate independently of the Global Positioning System if required and has improved knowledge of gravitational behavior many times over.

While concerned with gravity and the shape of the Earth, geodesy also touches on the most fundamental ways to represent the Earth. Can someone rely on the accuracy of a Mercator projection map, a polar stereographic map or a conic projection? Since a geodetic globe would present difficulties for navigators on board ships and aircraft as well as for simple classroom examination of a general or particular area, images of the Earth with greater utility necessarily represent compromises from the ideal. The latter would offer absolutely correct distances and directions. All areas would retain their natural shape and relative size. Parallels and meridians would always intersect at right angles, and both great circles and rhumb lines would appear as straight lines.

Since all of these attributes cannot coexist on a flat rectangular surface, maps and charts must permit compromises well known to the user. For example, the Mercator projection map, developed in the 16th century by Gerard Mercator, remains very popular because its conformal character displays most of the ideal map's characteristics. Mercator even managed to calculate mathematically an alternate spacing for the parallels of latitude to compensate in part for the distortion of the relative size of some land masses. Many different types of maps, including NGA's contemporary Digital Nautical Chart, address particular needs or employ different representational formulae to attain the best image of the Earth.

Geodesy's quest for fundamental principles and basic understanding informs all of NGA's tradecrafts. Geodesists seek both to discover the Earth's most basic attributes and to contribute to the effectiveness of national defense in the same way Maurice Ewing and Harry Hess did in collaborating with the Navy nearly 75 years ago. This offers a classic example of working together for the general welfare. The national defense becomes stronger while the well-being of the world community improves through a more intimate knowledge of the planet we inhabit.

Dr. Gary E. Weir is the NGA historian.



Geodetic Earth
Courtesy of the NASA Jet Propulsion Laboratory

DEPLOYER
Photo Contest

Winner, Best Photograph

This photograph shows a sheik in the Al Dora district of Baghdad, Iraq.

Photo by Scott L.

Winner, Best of Mission

This image shows two girls perched on a rock in the Farah province in Afghanistan.

Photo by Wayne D.

Team members with the National Geospatial-Intelligence Agency deploy around the world to provide geospatial intelligence for a variety of missions.

GEOINT shows in new and innovative ways what is happening on the Earth, foreshadowing future needs as well as demonstrating the effects events have on U.S. national security and other countries, cultures and people.

While on recent assignments, NGA team members captured the two photographs featured here. Each image reflects the faces of a culture from a personal perspective, shedding light on the human element behind GEOINT.

The photographs were chosen by the NGA work force as the winners of the agency's 2010 Expeditionary Operations Photo Contest.

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Technology—Rendering an Ever-Clearer Picture

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